

Overview of the Industry-University Cooperative Research Centers (IUCRC) Program

NSF EPSCoR Regional Outreach



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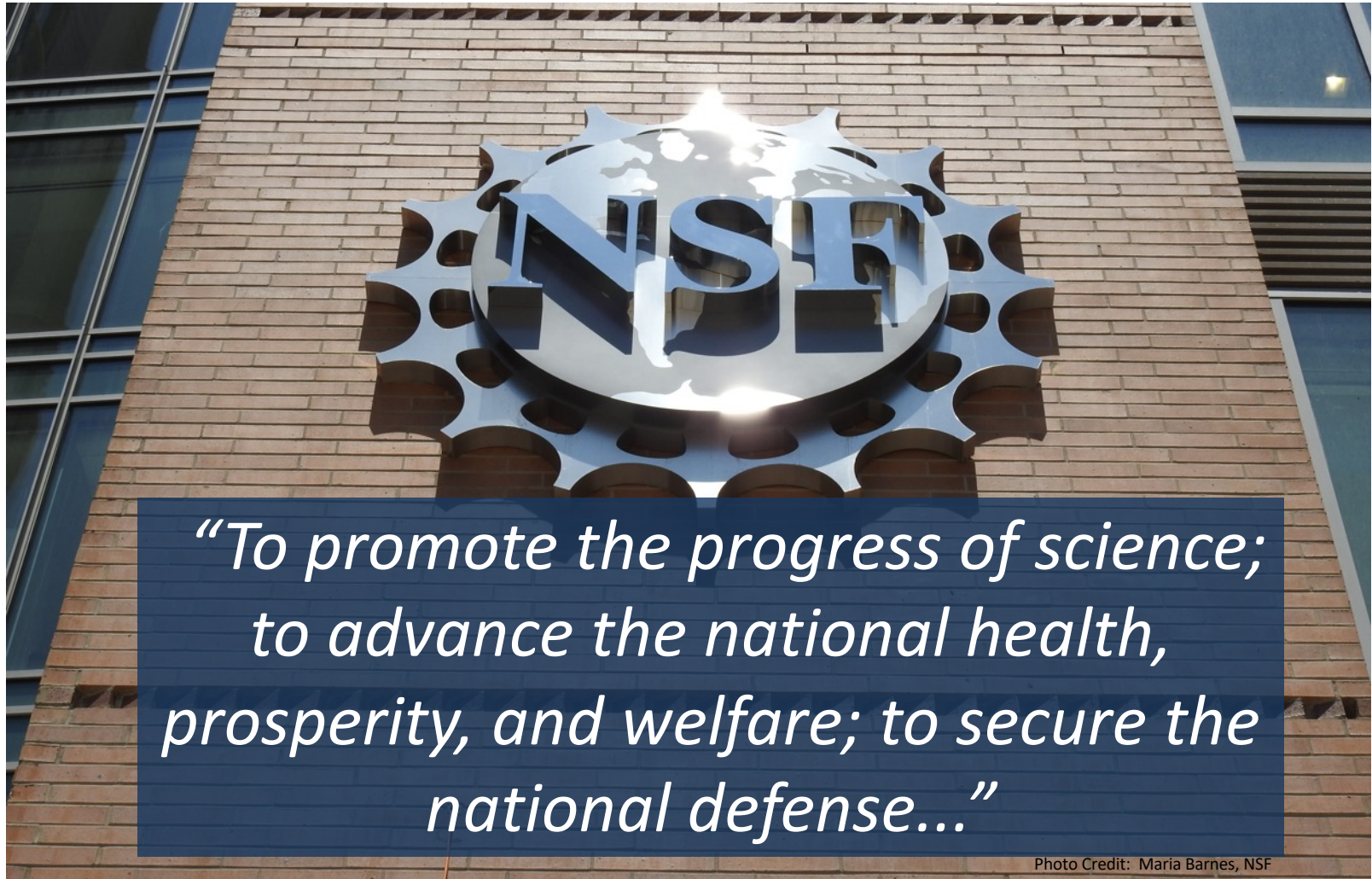
Program Director

National Science Foundation

April 2, 2019



NSF Mission



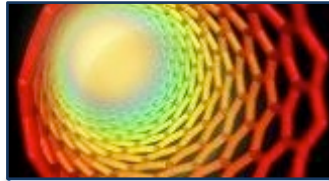
A quick snapshot...

NSF's Vision - A Nation that is the global leader in research and innovation

- ~\$7.8B Budget
- 230+ Nobel Laureates supported
- Overall: 386,000 researchers, postdoctoral fellows, trainees, teachers, and students supported
- ~400 startups/small businesses funded each year



NSF Funds All Fields of Science & Engineering



Engineering



**Computer &
Information
Science &
Engineering**



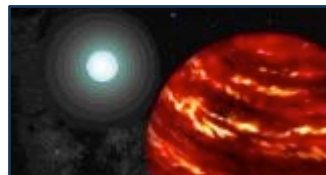
**Education &
Human
Resources**



**Geosciences
(including Polar
Programs)**



**Biological
Sciences**



**Mathematical
& Physical
Sciences**



**Social,
Behavioral &
Economic
Sciences**

Translational Research towards Commercialization



\$7.8B
Basic Research



Division of
Industrial
Innovation and
Partnerships (IIP)

\$265M
Translational Research

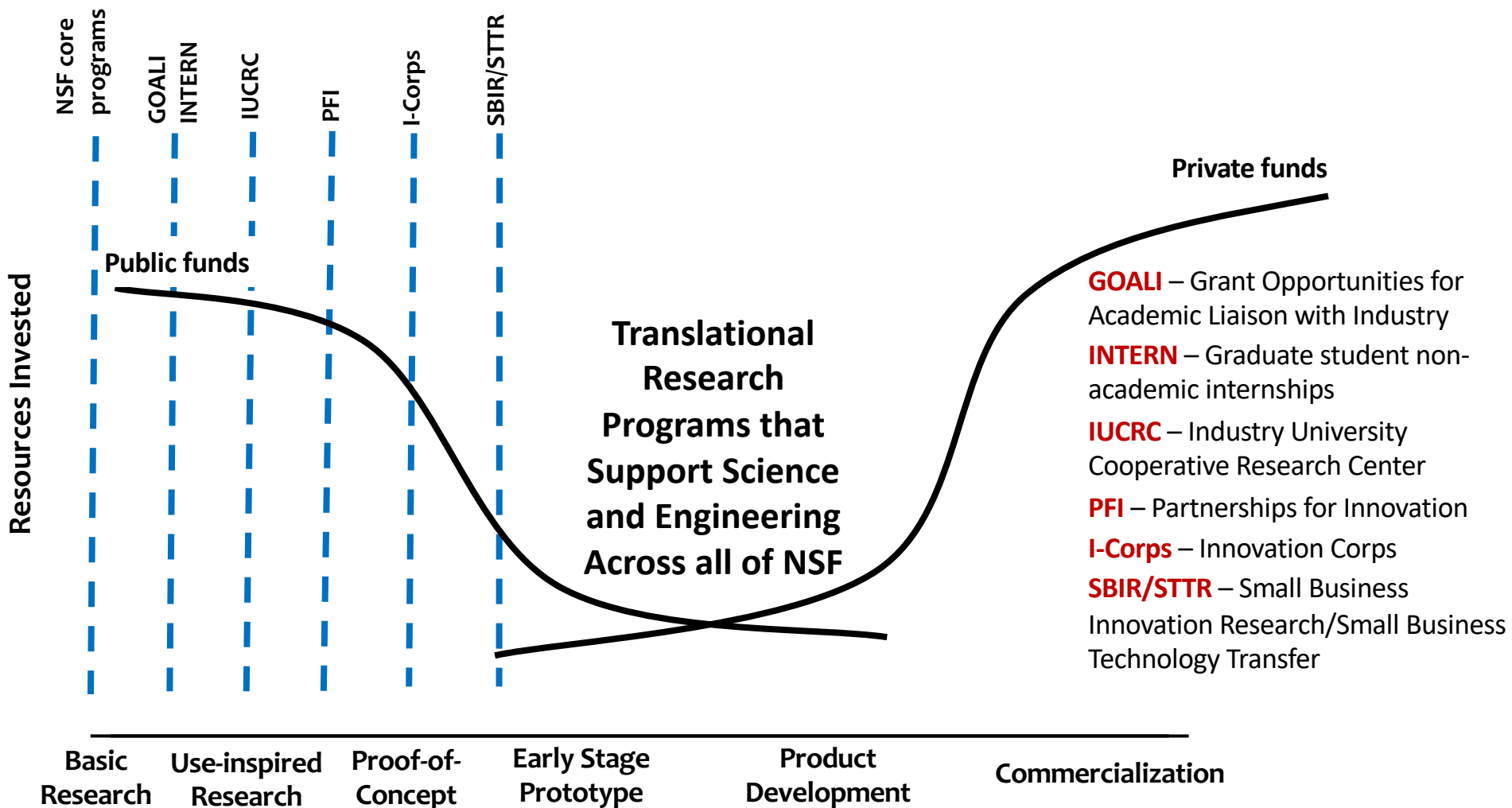


Programs for Tech
Translation
Partnerships &
Commercialization
Driven Activities



Division of Industrial Innovation and Partnerships

Driving basic research towards societal impact



Translational Research Programs

Industry University Cooperative Research Centers

<http://www.iucrc.org>

Grad Student INTERN Program : <55k, 6 months

<https://www.nsf.gov/INTERN>

Partnerships for Innovation : Technology development

<https://www.nsf.gov/PFI>

I-Corps™ - Entrepreneurial Education

www.nsf.gov/icorps

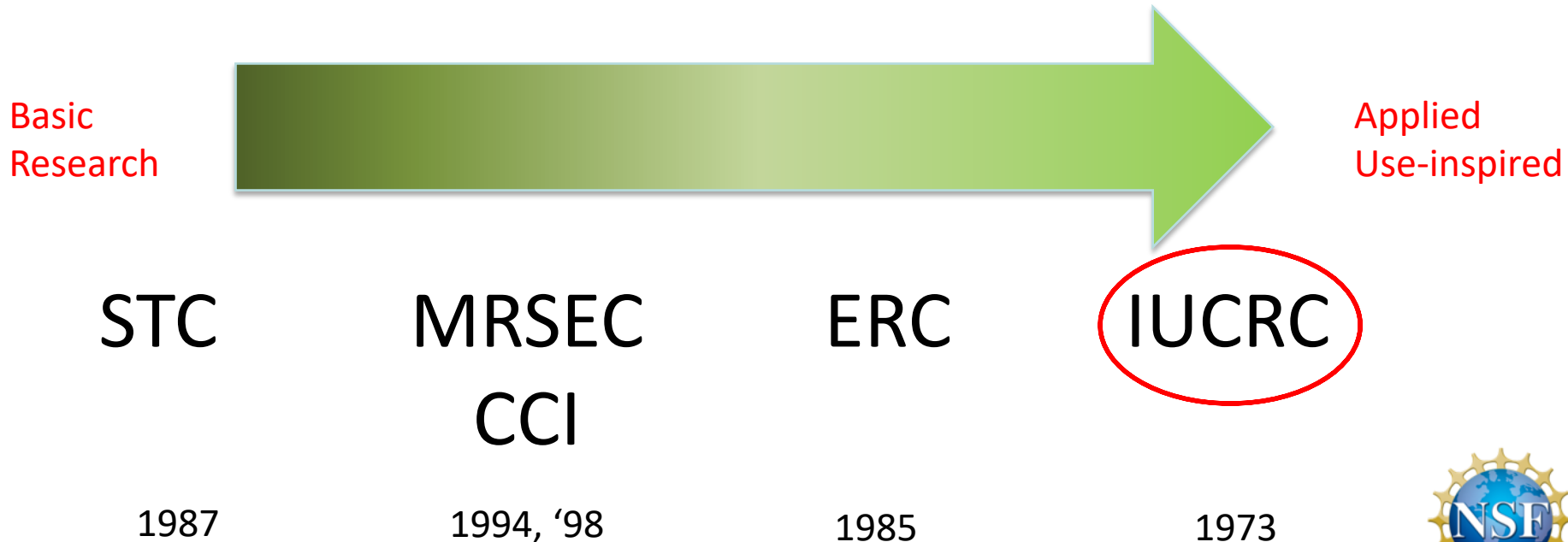
Small Business Innovation Research

<https://seedfund.nsf.gov>



NSF Funded Research Centers – a key investment

- **STC**: Science and Technology Centers
- **MRSEC**: Materials Research Science and Engineering Centers
- **CCI**: Centers for Chemical Innovation
- **ERC**: Engineering Research Centers
- **IUCRC**: Industry/University Cooperative Research Centers



Industry-University Cooperative Research Centers (IUCRC)

<http://www.iucrc.org/>

NSF Directorates supporting IUCRC Centers

- Engineering (ENG)
- Computer and Information Science and Engineering (CISE)
- Social Behavioral and Economic Sciences (SBE)
- Geosciences (GEO)



The Industry University Cooperative Research Program : I/UCRC

45 Years of Building Research and Innovation Capacity

- First Center Proposals Received in 1972
- First “Experimental” Awards Made in 1973

*Cooperatively Defined and Shared, Sector
Precompetitive Research*

“Determine effective ways of stimulating non-Federal Investment in R&D and of Improving the application of R&D results.”*

***President’s message to the Congress on S&T, March 16, 1972**



IUCRC Goals

- Develop **long-term partnerships** among industry, academe and government
- **Promote research programs of mutual interest**, contribute to the nation's research infrastructure base, enhance the intellectual capacity of the engineering or science workforce through the integration of research and education, and facilitate technology transfer.
- Leveraging NSF funds with industry to **support graduate students performing industrially relevant pre-competitive research**
- Expanding the innovation capacity of our nation's **competitive workforce** through partnerships between industries and universities; and
- Encouraging the nation's research enterprise to remain competitive through **active worldwide engagement** with academic and industrial leaders



What is an IUCRC?

- A Partnership: A mechanism to enable industrially-relevant, pre-competitive research via a sustained partnership among *industry*, *universities*, and *government*.
- Centers bring together
 - (1) IUCRC Sites (Academic Institutions)
 - Faculty and students from different academic institutions
 - (2) IUCRC Industry Members
 - Companies, State/Federal/Local government, and non-profits
- Focus
 - Perform cutting-edge pre-competitive fundamental research in science, engineering, technology area(s) of interest to industry and that can drive innovation and the U.S. economy.
 - *Members guide the direction of Center research through active involvement and mentoring.*

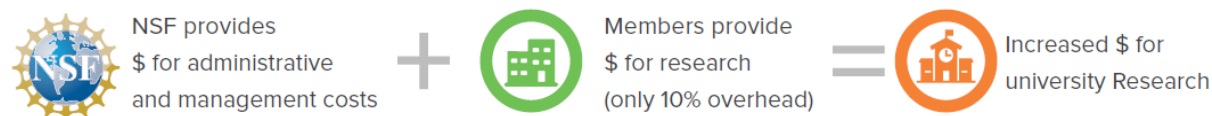


IUCRC Centers : An Innovation Network



Industry-University Cooperative Research Centers (IUCRC)

Collaborate strongly with industry
Leverage Industry funding
Industrial exposure to students/faculty



70+
Centers

100+
U.S. Universities

400+
Large Companies

300+
Small Companies

Federal & State
Government Agencies

Industry-inspired Centers

PRE-COMPETITIVE RESEARCH!

Broad areas of coverage

Advanced Electronics & Photonics

Advanced Manufacturing

Advanced Materials

Biotechnology

Civil Infrastructure Systems

Energy and Environment

Health and Safety

Information Communication &
Computing

System Design and Simulation



NSF's Role

Facilitate a Center environment in which long-term relationships between industry and academia can thrive.

- **Governance Model & Operational Framework**
- Provide 40+ year experience managing IUCRCs
- **Franchise of centers for collaboration**
- Provide deep networking opportunities
- **NSF Award – Seed Funding Opportunities/Oversight**

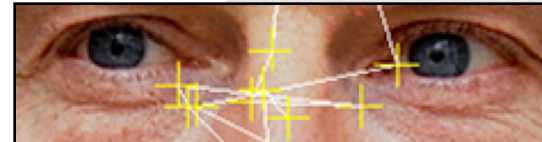
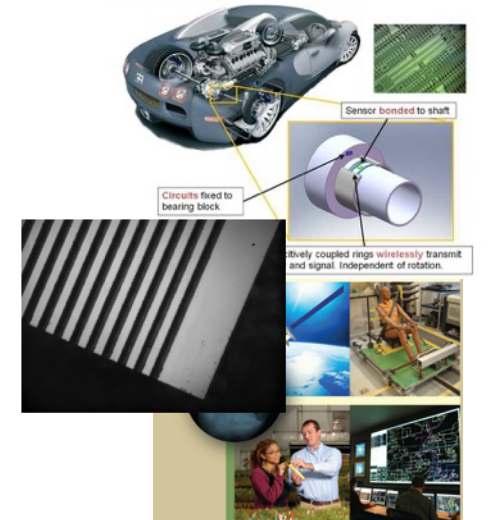


75 IUCRC Centers

100+ Universities, 800+ members

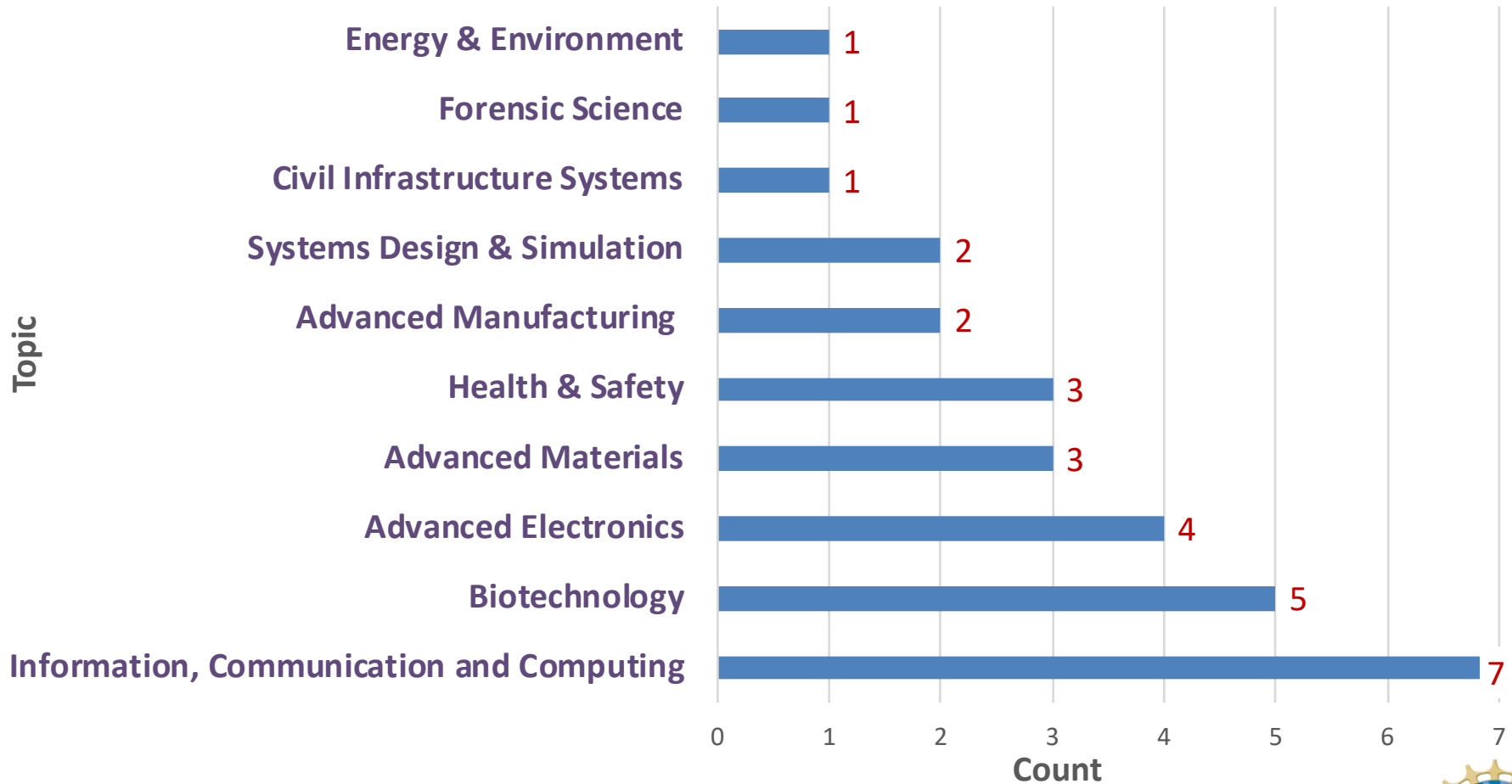
Broad Research Themes

- Advanced Electronics and Photonics (6 centers)
- Advanced Manufacturing 8
- Advanced Materials 8
- Biotechnology 7
- Civil Infrastructure Systems 1
- Energy and Environment 10
- Forensic science 1
- Geosciences 2
- Health and Safety 5
- IT, Communication, and Computing 24
- System Design and Simulation 2



29 IUCRC Centers involve EPSCoR States

IUCRC Centers by Technology Area with sites n EPSCoR States



IUCRC Value for Universities

1,630

center-trained students
hired by members
(2008–2017)



Student Support

Enhance resources available
for student training, skills
development, and job placement



Broader Impact

Work with industry
to address societal
challenges



Funding

Increase and diversify
research funding through
industry-driven research



Feedback

Receive industry guidance
on research projects



Collaboration

Build relationships
and develop industry
partnerships for
technology transfer



Access

Access to industry
information to spur
innovation



IUCRC Value for Members

FAST FACTS

(Data from 2017)

1:33

\$1 in member
contributions leverage
\$33 additional dollars in
research funding



Access to Talent

Opportunity to mentor
and train students to attain
desired skills for work in your
industry



Leverage Research Dollars

Earn higher return on investment
when research is jointly funded



De-Risk R&D

Share risks of early stage
research leading to disruptive
business opportunities



Access to Network

Learn from interacting with
center participants within your
technology sector



Research Cost Avoidance

Save internal research dollars through
access to facilities, infrastructure,
and lower human capital costs



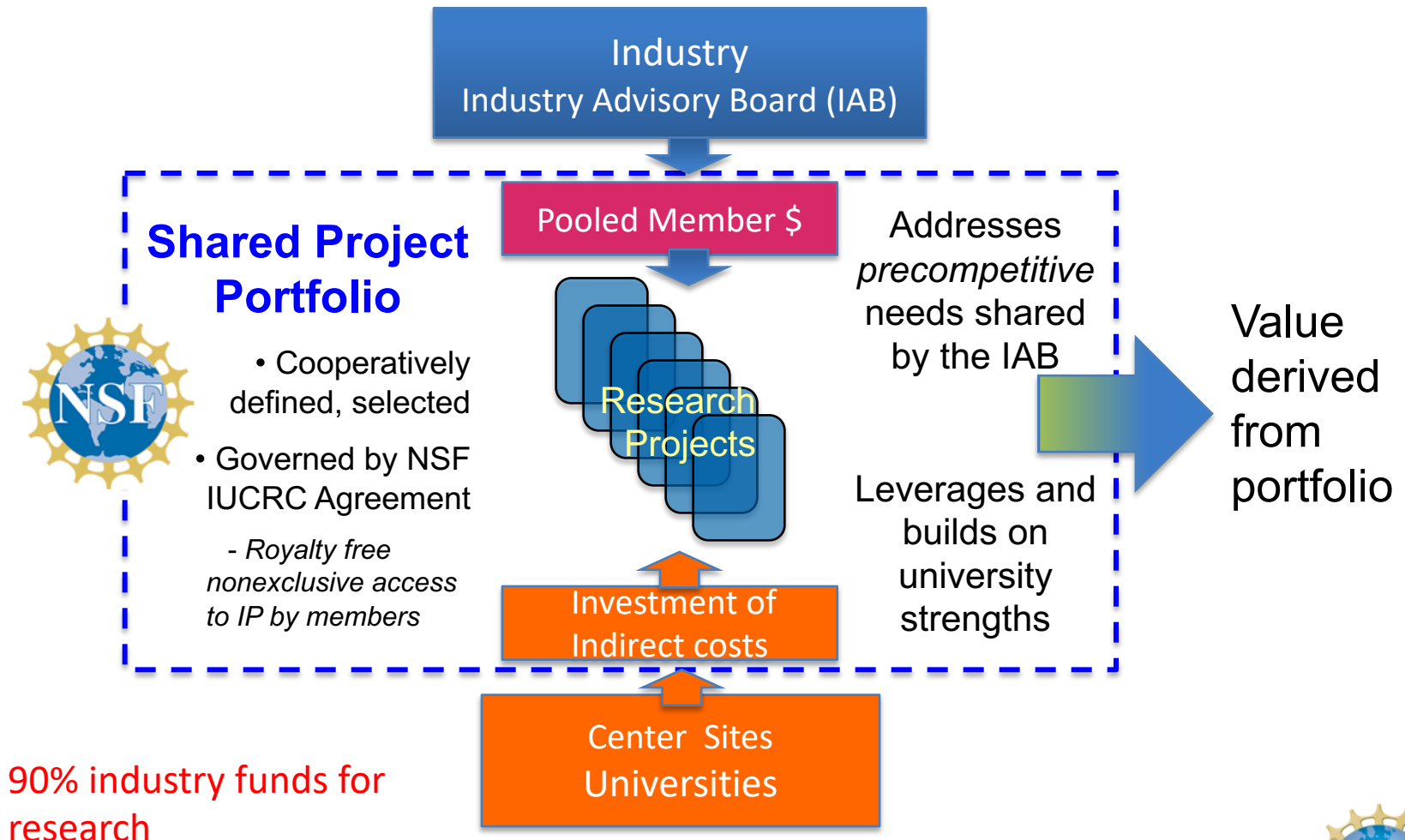
Access to Intellectual Property

Gain royalty-free, non-exclusive
licenses on intellectual property
produced in the center

Facilities & Administrative overhead rate fixed at 10%



IUCRC Tenets: use-inspired, pre-competitive research portfolio that is cooperatively defined and funded on the basis of shared value



Requires trust be built in the model, and between all partners in the center.



IUCRC Membership Agreement

- **Parties to Agreement: University and Center**
- **Annual membership fee structure**
- Industrial Advisory Board – one representative from each company per membership
- Patent rights held by university, with royalty free, non-exclusive rights to center members
- Companies wishing to exercise rights to a royalty-free license pay for the costs of patent application
- If only one company seeks a license, that company may obtain an exclusive fee-bearing license
- NSF has March-in Rights under Bayh-Dole
- Publication delay policy – typical 90 days

Widely
accepted
across 1000s
of firms in
IUCRC
Program

All Members sign the NSF agreement upon Center Award

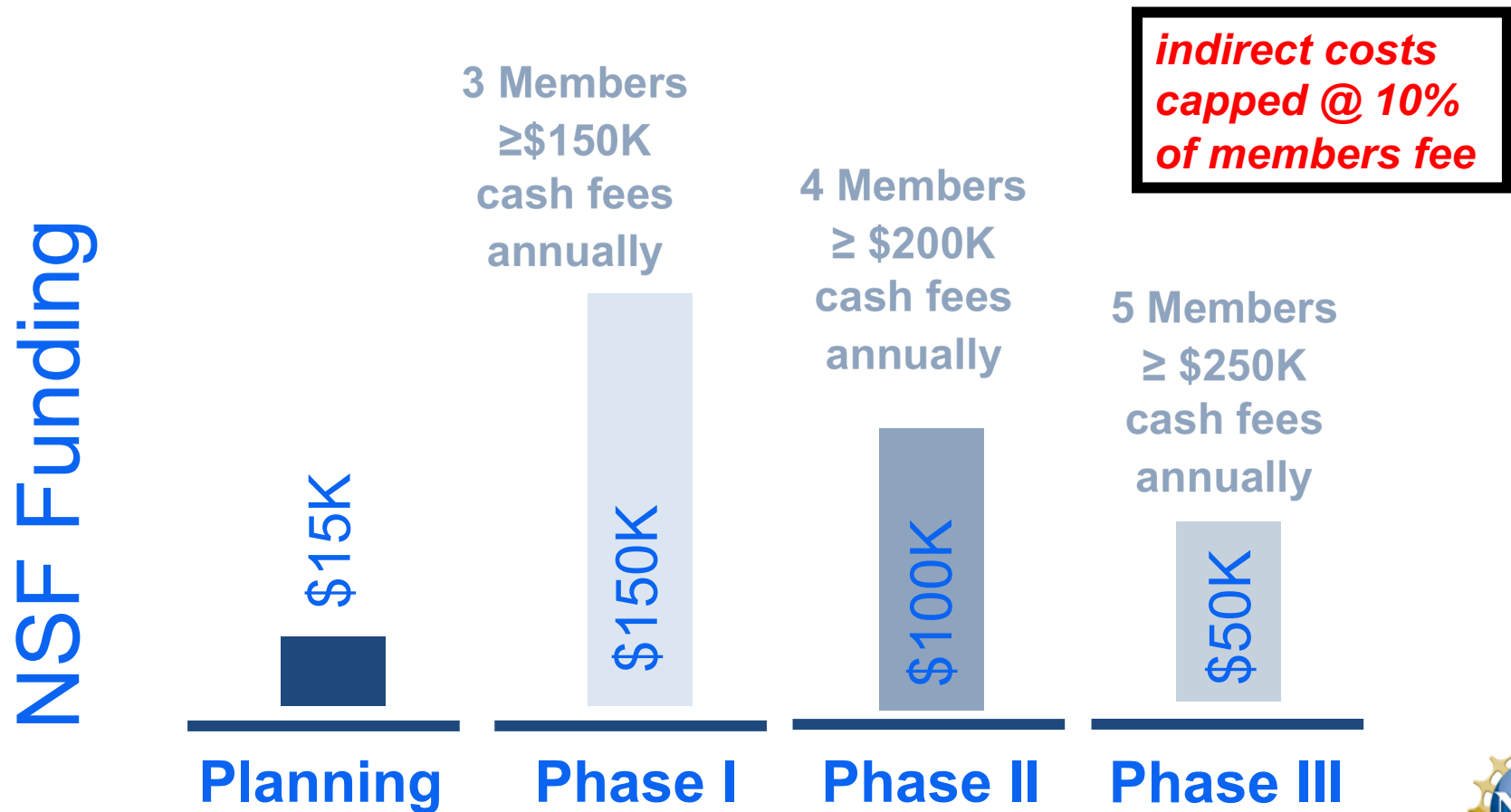
- **ONE center, and ONE membership agreement**



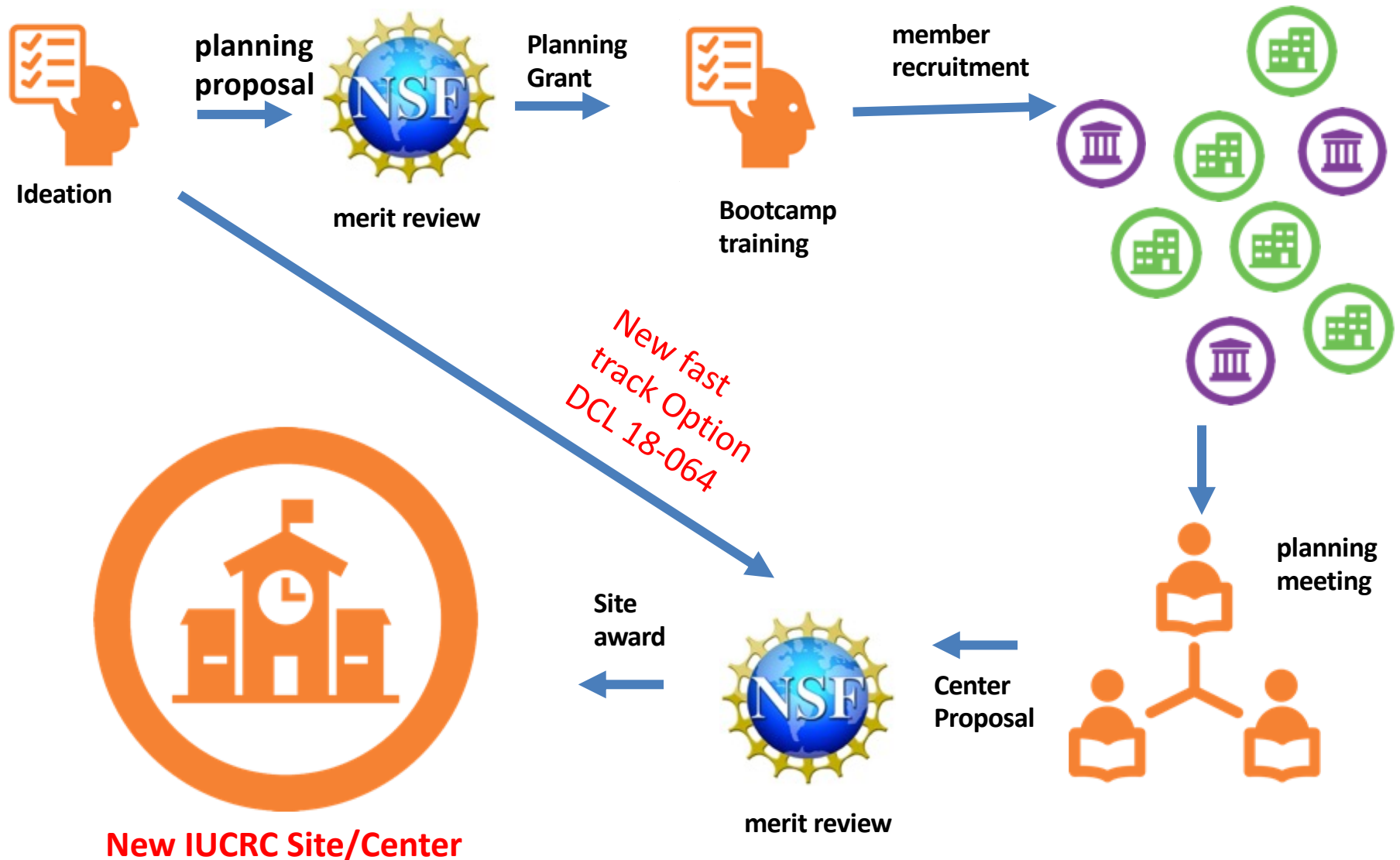
IUCRC Funding : Three 5-Year Phases

One or more universities form a center

NSF supports operations, **Industry funds research**



Path to center creation



Key outcomes from a planning workshop

- Strong Convergence between academia and industry on **broad cutting edge, high impact** Center research thrusts
- Industry engagement via **financial commitments** to support a new center
- Competitive Proposal to NSF for creation of a Phase I IUCRC Center



Assessing a Planning Grant Proposal



planning
proposal



merit review

Each University Site
submits a separate
proposal

- Mission and Vision
- Why Create the center? Responsive to societal needs? Industry collaboration potential? Strong Industrial interest?
- Are the proposed projects state of the art?
- Economic impact potential?
- Strength of the Team, Facilities and institutional collaboration potential?
- Does the Site and the envisioned Center have an effective strategy and plan to build strong industry membership?



Assessing a Phase I Proposal

- Did prior planning activities effectively engage industry?
- Is there evidence of good convergence between academia and industry
 - broad **cutting edge** emerging research thrusts identified?
 - potential for **transformative knowledge creation** driven by industrial need?
 - **High economic impact potential** in the research arena pursued by the center?
- Is the center addressing an unmet or underserved research need? Is there an identified research roadmap to the center's future?
- Is there potential for workforce development and training of students and under-represented groups in center research?
- What is the strength of the team assembled to support the center?
- What are the unique capabilities contributed to the center by the university site?
- Is there a clear plan to market the center effectively to grow membership?



A few IUCRC Center examples...





Research Thrusts

- Addressing pesticide resistance issues
- Pest-tolerant plants/crops
- Identification of novel and new pest control measures
- Pest control optimization

Mission

Effective management of arthropod and nematode pests through pre-competitive research prioritized by center members, and training of personnel for future employment within industry

Center members include



Unlocking the Power of RNA-interference (RNAi) technology for agricultural insect pest control

RNAi, a powerful new tool for pest control



Colorado Potato Beetle



RNAi does not work well in some major insect pests e.g. **Fall Armyworm**



- Center research shed new light on **how RNAi problems can be overcome**
- Industry members are developing a new generation of RNAi pest control products for the **\$84 billion global pesticides market**

Mission: Serving the Automotive and ground transportation industry

Technical focus areas:

- Electrified vehicle powertrains
- Conventional powertrains and alternative fuels
- Vehicle systems optimization
- Efficient and sustainable autonomous vehicles
- Ground transportation systems and infrastructure

University Sites

THE UNIVERSITY OF
ALABAMA

ASU ARIZONA STATE
 UNIVERSITY

UNIVERSITY OF
LOUISVILLE

TEXAS
 The University of Texas at Austin

DGIST⁺
 Daegu Gyeongbuk
 Institute of Science and Technology

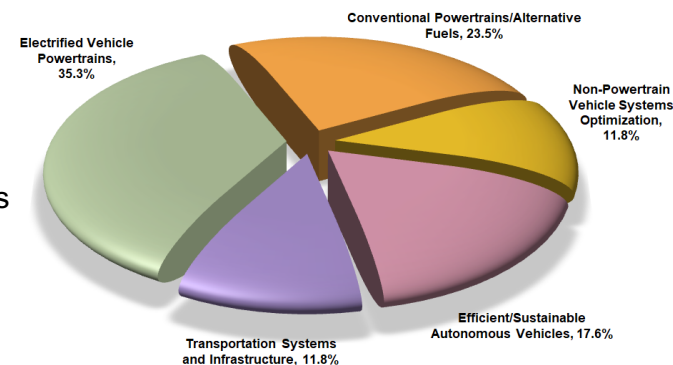
Members



- 4 OEM vehicle manufacturers
- 4 Tier 1 automotive suppliers
- 4 Tier 2 or Tier 3 automotive suppliers
- 1 public utility company
- 1 state/government organization
- 1 research institute
- 1 federal organization
- 3 DGIST membership commitments

Projects

17 center-funded projects encompassing all five technical focus areas are currently underway, distributed as follows:



**International Site Under Review*

SCeMFis

Science & Industry
Working Together for
Sustainable Fisheries



VIMS | WILLIAM & MARY
VIRGINIA INSTITUTE OF MARINE SCIENCE

Mission:

SCeMFis uses academic, recreational, and commercial fisheries resources to address urgent scientific problems limiting sustainable fisheries.

Value proposition:

Economic health requires simultaneously:

- Sustainable fish and shellfish stocks
- Sustainable fish and shellfish fisheries.

Target fisheries:

Atlantic surfclams
Summer flounder
Atlantic menhaden
Ocean quahog
Black sea bass
Gulf menhaden
Scup
Short-finned squid
Longfin squid
Chub mackerel

Value Added and Economic Impacts By Market Segment
Massachusetts Surf Clams -2014

	Direct Impact (\$000)	Indirect Impacts (\$000)	Total Impact (\$000)
Harvest	\$16,794	\$8,038	\$24,832
Primary Wholesale/Processing	\$32,244	\$20,938	\$53,182
Secondary Wholesale/Distribution	\$5,885	\$3,267	\$9,151
Final Retail	\$5,215	\$2,714	\$7,929
Final Food Service	\$121,693	\$93,533	\$215,226
Total	\$181,831	\$128,489	\$310,320



CB² Center for Bioplastics and Biocomposites

**IOWA STATE
UNIVERSITY**



**UNIVERSITY OF
GEORGIA**

**WASHINGTON STATE
UNIVERSITY**

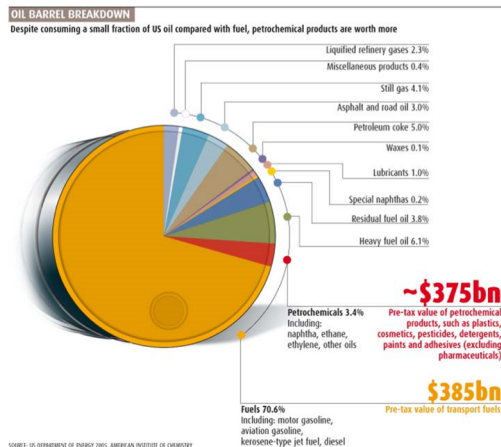
Mission:

CB² will **develop knowledge** about an array of high-value products from agricultural, forest feedstocks:

- Plastics
- Coatings
- Adhesives
- Composites

Value proposition:

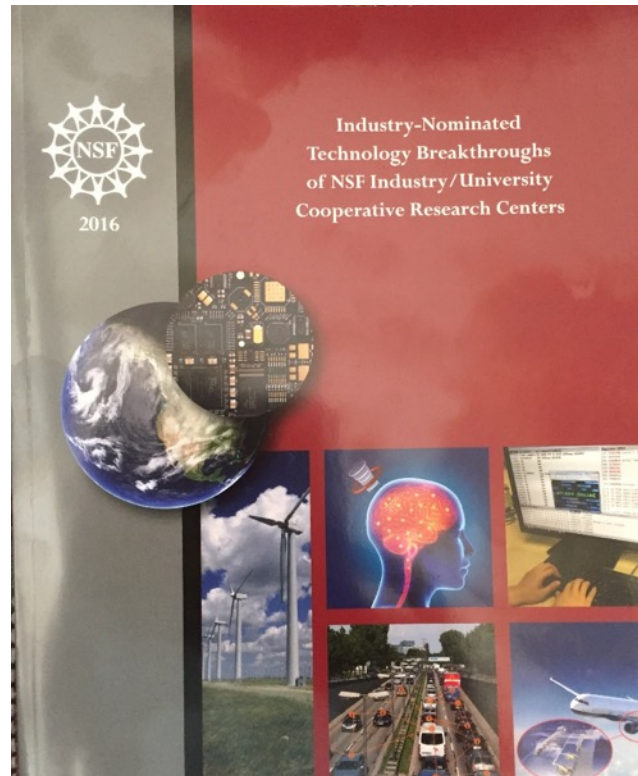
- Increase of value of renewable materials
- Economic growth of US economy



Members:



2016 Compendium of Industry-Nominated IUCRC Technology Breakthroughs (iucrc.org)



Over 1400 Publications in '13, 248 co-authored w/Members

<http://www.iucrc.org/breakthroughs>



2019 IUCRC Deadlines

- Preliminary Proposal – **Apr & Oct – 3rd Wed**
 - Cover Page, 2 page project description, 2 pages bio sketches
 - Rapid Program Director review
 - You receive an Encourage/Discourage recommendation for Full proposal Submission
 - Discouraged proposals may still submit a Full Proposal
- Full Proposal **Jun and Dec – 3rd Wed**



Centers meet industry twice a year

<http://iucrc.org/meetings-and-events>

- There are ~150 two-day Center meetings occurring each year
- Connect with a center director at an IUCRC to learn more
- Ask to attend an IUCRC Center meeting
- Contact info available at www.iucrc.org

Month		Agenda		MAY 2019							< Prev Next >	
Mo	Tu	We	Th	Fr	Sa	Su						
29	30	1 CISE CRIS Center for Research in Intelligent Storage (CRIS)	2 CISE CCBGM CCBGM BiAnnual Meeting	3	4	5 ENG MAST Spring MAST Center IAB Meeting						
6 « ENG MAST Spring MAST Center IAB Meeting ENG ATOMIC ATOMIC IAB MEETING	7 ENG MIST MIST Center Spring Meeting	8	9	10	11	12						
13	14 ENG CCOMC Semi-Annual IAB Meeting ENG WET WET IAB Meeting ENG CDP Center for Dielectrics & Piezoelectrics	15 SHAP3D ENG SHAP3D Spring IAB Meeting CISE CITeR Center for Identification Technology Research (CITeR) ENG CAMTech CAMTech Spring IAB Meeting, May, 2019	16 ENG FIWIN FIWIN	17	18	19						
20	21 ENG GRAPES Semi Annual IAB Meeting ENG CB2 CB2 Spring 2019 IAB Meeting	22	23 CARD Semi-Annual IAB meeting	24	25	26						
27	28	29	30	31	1	2						





IUCRC global expansion

International Sites

- Explore the potential to develop a true, mutually beneficial collaboration with an established IUCRC
- An established IUCRC may submit a supplement request for collaborative work with the international research entity
 - NSF Funding supports research visits and expenses related to international collaboration (including students and junior investigators)
 - \$25K, 12 months with possible renewal

Supplements are subject to the NSF merit review process





IUCRC international expansion

- Academic institution with complimentary expertise to an established IUCRC
- Infrastructure to enable research collaboration
- Commitment letters from companies that demonstrate the Academic Institution will have industry dollars to support research
 - Companies become members of an IUCRC by signing membership agreement
 - Must be able to agree to the terms in membership agreement



Building and Launching a Successful IUCRC....

- Takes an entrepreneurial mindset. Challenges are similar to launching a startup.
-
- Build a strong leadership team. Pull together a dedicated group of core faculty researchers
- Develop strong cross-institutional support.
- Engage in extensive customer discovery
- Bring on a key team member with strong and deep industrial experience to guide the academic team
- Network, Network and then some more.....



Thank you!

Questions?

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